

Investigating the Lithium Potential of Brines in Saskatchewan: New Results from Brine and Core Sampling

Gavin K.S. Jensen
Saskatchewan Geological Survey

Benjamin J. Rostron
University of Alberta, Dept of Earth & Atmospheric Sciences

Abstract

The rising demand and subsequent increase in the cost of lithium has resulted in the possibility of producing this element from non-traditional sources, such as highly saline brines, which have lithium concentrations of 500 milligrams per litre (the concentration of lithium produced from brines in South America) or lower. The vast volume of brines present in the subsurface of Saskatchewan, which may contain economically significant amounts of trace elements, have the potential to create a new industry for the province.

The brine sampling project commenced in 2011 by the Saskatchewan Geological Survey driven by the demand of lithium and other trace elements that could potentially be derived from basinal brines. Since 2011 the survey has sampled Paleozoic aged wells from southeastern and west-central Saskatchewan with the goal of developing a database of major and minor elements present in the formation waters in Saskatchewan (Jensen, 2011; Jensen, 2016; Jensen & Rostron, 2017)

This project's goal is to determine the distribution and concentration of the major and minor elements present in subsurface brines in Saskatchewan. Typical brine analysis only measures for major elements; therefore, the data collected on the minor elements represent some of the first publicly available data for minor elements in the province.

The project commenced with sampling of wells in southeastern Saskatchewan that produced from Lower Paleozoic formations. Sampling continued in other Paleozoic strata in 2012, 2013, 2016 and 2017. The latest sampling was in the summer of 2018, to include strata in southwestern Saskatchewan and to resample some wells to investigate if there was a change in the chemistry of the brine being produced. The resampling was completed as companies would require a consistent concentration of the necessary elements to ensure the economic viability of their project. The data show a large variation stratigraphically as well as spatially, halogen systematics can be applied which could elucidate the history of brine evolution.

In 2019, the Survey started to analyze cores for lithium concentrations. Duperow cores were the first to be analyzed as the highest lithium concentration from the produced brines were

observed from Duperow wells (Jensen, 2015). Fortuitously the well (14-12-7-11W2) with the greatest lithium concentration had been cored in the Duperow. Eighteen samples were taken from this core in the Duperow formation, lithium concentrations range from 1 ppm to 120 ppm. This provides some of the first publicly available trace element data for core in the province. While more sampling from numerous Lower Paleozoic cores are currently being completed, these results provide a first step to a better understanding of the potential source of lithium that is present in the brines of Saskatchewan.

References

- Jensen, G.K.S. (2011): Investigating the mineral potential of brines in southeastern Saskatchewan; *in* Summary of Investigations 2011, Volume 2, Saskatchewan Geological Survey, Saskatchewan Ministry of Energy and Resources, Miscellaneous Report 2011-4.2, Paper A-12, 3p.
- Jensen, G.K.S. (2015): Trace element and other analyses of Paleozoic-aged brines from southeastern Saskatchewan (Townships 1 to 13, Ranges 5 to 21 W2M); Saskatchewan Ministry of the Economy, Saskatchewan Geological Survey, Data File Report 37.
- Jensen, G.K.S. (2016): Results from the 2016 field season for the brine sampling project: investigating the mineral potential of brines in Saskatchewan; *in* Summary of Investigations 2016, Volume 1, Saskatchewan Geological Survey, Saskatchewan Ministry of the Economy, Miscellaneous Report 2016-4.1, Paper A-3, 7p.
- Jensen, G.K.S. and Rostron, B.J. (2017): Investigating the mineral potential of brines in Saskatchewan: results from the 2017 field season for the brine sampling project; *in* Summary of Investigations 2017, Volume 1, Saskatchewan Geological Survey, Saskatchewan Ministry of the Economy, Miscellaneous Report 2017-4.1, Paper A-1, 6p.